

## REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words) Four students were supported on the AASERT, and their work covered many important areas of control theory (see attached).  Two projects formulated and proved the convergence of reasonable adaptive algorithms for communication systems with many competing users. Other projects developed efficient coding methods via dynamic programming methods, and efficient numerical methods for optical stochastic control.			
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Robert Buche worked on adaptive problems in communications networks. In one Model, there are several alternative services (say guaranteed service and best effort services (say guaranteed service and best effort service). The arriving user must choose, based on the available data and his immediate self interest in minimizing time in the system or some other cost). It is shown that natural and flexible user strategies converge to the desired Nash equilibrium for the entire system, guaranteeing the best allocation in the long run.

John Curren worked on problems in which there are many competing users of a resource system. There is learning in the system, and each user adapts his selection of which resource to use on the basis of past experiences. Interaction occurs because the cost for the use of a given resource depends on the loading of the collection of resources by all users. Key mathematical issues involve characterization of simpler limit models obtained in the limit as the number of users tend to infinity, and key practical issues include the identification and stability analysis of equilibrium loading patterns.

Kevin Kochanek developed efficient decoding methods. The work concerns linear parametrization of communication codes, and efficient algorithms for maximum likelihood decoding via dynamic programming.

Adam Szpiro worked on numerical methods for tracking problems. He is developing higher order Markov chain approximations, and these apply as well to risk sensitive and robust nonlinear stochastic control.